

### **REMARKS**

Claims 1, 2, 4, 7, 11, 13, 14, 17, 34, 38, 45, 48, 51, 53, 61, 62, 64, 66, 68, and 70 are pending in the application. Claims 2, 11, 34, and 38 are amended to clarify the meaning of the claims.

#### **35 U.S.C. § 112 Rejections**

Reconsideration is requested of the rejection of claims 11, 34, and 38 as being indefinite under 35 U.S.C. § 112, second paragraph. Without conceding the propriety of the rejection and to advance prosecution, claims 11, 34, and 38 have been amended. Claim 11 has been amended to make clear that the "anode enzyme" has the claimed characteristics. Claim 34 is amended to add that the "anode and/or cathode is formed for flow" and thus, the flow rate is related to that structural element of the anode or cathode. Claim 38 is amended to make clear that the immobilization material is immobilizing the anode and/or cathode enzyme. Thus, claims 11, 34, and 38 satisfy the definiteness requirement of 35 U.S.C. § 112, second paragraph.

#### **35 U.S.C. § 102 Rejections**

Reconsideration is respectfully requested of the rejection of claims 45 and 51 as anticipated by Klitsner et al. (US 2002/0122972) under 35 U.S.C. 102(b). The Office asserts that

as seen in figure 2a, the surface facing the electrolyte (70) is irregular and has a three-dimensional topography. It would thus inherently be able to induce convective fluid flow. Since the electrode includes carbon particles (62) and Nafion polymer (paragraph 0046), it would comprise a carbon-based ink.<sup>1</sup>

Claim 45 is directed to electrodes comprising an electron conductor having a width less than about 200  $\mu\text{m}$  and at least one surface having an irregular, three dimensional topography capable of inducing convective flow of the fuel fluid over said surface.

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<sup>1</sup> See Office action dated March 20, 2008 at page 2.

Klitsner generally describes conventional fuel cells that use platinum catalysts and have an etch-processed, conductive, porous film for use in electrodes. These fuel cells typically use hydrogen for fuel and oxygen as an oxidant. These fuels are in the gas phase. Figure 2a depicts a Nafion<sup>®</sup> layer that has a carbon-supported platinum layer disposed thereon.

Claim 45 requires that the electron conductor have a width less than about 200 µm and an irregular, three dimensional topography. In the passage describing Figure 2a it is unclear whether there is a sufficient amount of the carbon support in the carbon-supported platinum layer for it to be considered an electron conductor. All the other electrode embodiments have a metal electron conductor (e.g., gold), and thus, upon contemplating Figure 2a and the corresponding description, it is unclear whether an electron conductor is present. Further, even if an electron conductor is present, the method of disposing the platinum particles on the Nafion<sup>®</sup> layer is not described, so this electron conductor would not *necessarily and inevitably* had an irregular, three dimensional topography capable of inducing convective flow of the fuel fluid over the electron conductor as required by claim 45. There are many ways that the carbon-supported platinum layer could have been applied to the Nafion<sup>®</sup> layer (e.g., laid down on the Nafion<sup>®</sup> as a slurry and allowed to dry) that would have provided an electron conductor not having the required topography.

Claim 51 depends from claim 45, incorporates all the elements of claim 45 and adds the requirement that the electrode comprise a carbon-based ink. Contrary to the Office's assertion that "since the electrode includes carbon particles (62) and Nafion polymer (paragraph 0046), it would comprise a carbon-based ink,"<sup>2</sup> Figure 2a clearly shows a discrete layer of Nafion<sup>®</sup> covered by a layer of carbon-supported platinum. Thus, the Nafion<sup>®</sup> and carbon particles are not mixed together in a suspension as required to have a carbon-based ink, and claims 45 and 51 are not anticipated by Klitsner.

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<sup>2</sup> See id.

Reconsideration is requested of the rejection of claims 1, 2, 4, 7, 11, 13, 17, 34, and 38 as anticipated by Minter et al. (US 2005/0095466) under 35 U.S.C. § 102(e).

The Office asserts that Minter et al. disclose

a biofuel cell that includes a biocathode and bioanode that each include the presently recited materials, including electron conductors..., electron mediators..., electrocatalysts..., enzymes..., and enzyme immobilization materials..., such as those with a micellar or reverse micellar structure....<sup>3</sup>

Minter et al. generally describe biocathodes and bioanodes as the Office describes, however, the biofuel cells described by Minter et al. are described in many embodiments as layered on an electron conductor.

In contrast, the claimed biofuel cells are fabricated on a substrate wherein the substrate "can be made of any material that is not conductive, will not passivate the conductive material of the microelectrode, to which the conductive material will adhere throughout processing, and to which molds can be reversibly sealed."<sup>4</sup> This element of a non-conducting substrate required by claim 1 and the claims that depend therefrom (e.g., claims 2, 4, 7, 11, 13, 17, 34, and 38) is not disclosed explicitly or inherently in the Minter reference. Thus, claims 1, 2, 4, 7, 11, 13, 17, 34, and 38 are not anticipated by Minter et al. under 35 U.S.C. § 102(e).

### 35 U.S.C. § 103 Rejections

There are three criteria for establishing a *prima facie* case of obviousness.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach all or suggest all the claim limitations.<sup>5</sup>

Further, as noted in M.P.E.P. §2112.IV, an obviousness rejection based upon the inherency of a claimed element must be supported by evidence that the missing

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<sup>3</sup> See *Id.* at page 3.

<sup>4</sup> See specification at paragraph [0111].

<sup>5</sup> See M.P.E.P. § 2143.

element is necessarily present in the references, and that it would be so recognized by one skilled in the art:

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' " *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted). . . .

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original) (Applicant's invention was directed to a biaxially oriented, flexible dilation catheter balloon (a tube which expands upon inflation) used, for example, in clearing the blood vessels of heart patients). The examiner applied a U.S. patent to Schjeldahl which disclosed injection molding a tubular preform and then injecting air into the preform to expand it against a mold (blow molding). The reference did not directly state that the end product balloon was biaxially oriented. It did disclose that the balloon was "formed from a thin flexible inelastic, high tensile strength, biaxially oriented synthetic plastic material." *Id.* at 1462 (emphasis in original). The examiner argued that Schjeldahl's balloon was inherently biaxially oriented. The Board reversed on the basis that the examiner did not provide objective evidence or cogent technical reasoning to support the conclusion of inherency.).

Reconsideration is respectfully requested of claims 48 and 53 as unpatentable over Klitsner et al. Claim 48 depends from claim 45, incorporates all the elements of claim 45 and adds the element that the electrode has a width of between about 10  $\mu\text{m}$  and 50  $\mu\text{m}$ . The Office asserts that "determining the overall size for the electrode would

be within the skill of the artisan."<sup>6</sup> The Klitsner reference is described in more detail above. The Office's assertion ignores the fact that the Klitsner reference does not describe all the elements of the claim either explicitly or inherently. Further, the claimed electrode would not have *necessarily and inevitably* resulted from the Klitsner disclosure because there is not a description of the method for disposing the carbon-supported platinum on the Nafion<sup>®</sup> and there are many ways it could have been applied that would not have resulted in an electrode with the claimed topography. Thus, claim 48 is patentable over the Klitsner reference under 35 U.S.C. § 103.

Claim 53 is directed to an electrode comprising an electron conductor having an effective surface area that is at least 1.5 times greater than its geometric surface area, wherein one dimension of the electrode is less than 100  $\mu\text{m}$ . The Office asserts that determining "an optimal surface area would also be within the skill of the artisan...."<sup>7</sup> While optimizing surface area might be considered desirable, the Klitsner reference does not disclose nor suggest it is desirable and a skilled person would not have known how to increase the surface area as required by claim 53 from a reading of the reference. Specifically, as described in more detail above, the method for disposing the carbon-supported platinum on the Nafion<sup>®</sup> layer is not described and there is no cogent technical reasoning why such a surface area increase would have been obvious to a person of ordinary skill from contemplation of the Klitsner reference. Thus, claim 53 is patentable over the Klitsner reference under 35 U.S.C. § 103.

Reconsideration of the rejection is requested of claims 1, 2, 4, 7, 11, 13, 17, 34, and 38 as unpatentable over Minter et al. in view of Klitsner. In this rejection, Minter et al. is applied as 35 U.S.C. 102(e) prior art. However, 35 U.S.C. § 103(c)(1) states the following.

Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the claimed invention was made, owned by the same person or subject to an obligation of assignment to the same person.

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<sup>6</sup> See Office action dated March 20, 2008 at page 3.

<sup>7</sup> See id. at pages 3-4.

In this case, the inventors of the subject matter claimed in the instant application and the inventors of the subject matter claimed in the Minter reference were subject to an obligation to assign the invention to Saint Louis University at the time the instant invention was made. Thus, the Minter reference is not prior art for purposes of a 35 U.S.C. § 103 rejection.

**Allowed Subject Matter**

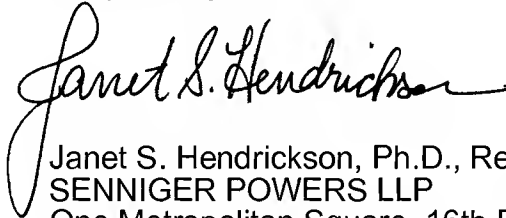
Applicants acknowledge the indication that claims 61, 62, 64, 68, and 70 are allowed. However, applicants believe that the current amendments to the claims along with the arguments render the remaining claims allowable as well.

**CONCLUSION**

Applicants submit that the present application is in condition for allowance and request early allowance of the pending claims.

The Commissioner is hereby authorized to charge any under payment or credit any over payment to Deposit Account No. 19-1345.

Respectfully submitted,

A handwritten signature in black ink, reading "Janet S. Hendrickson", with a stylized flourish at the end.

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